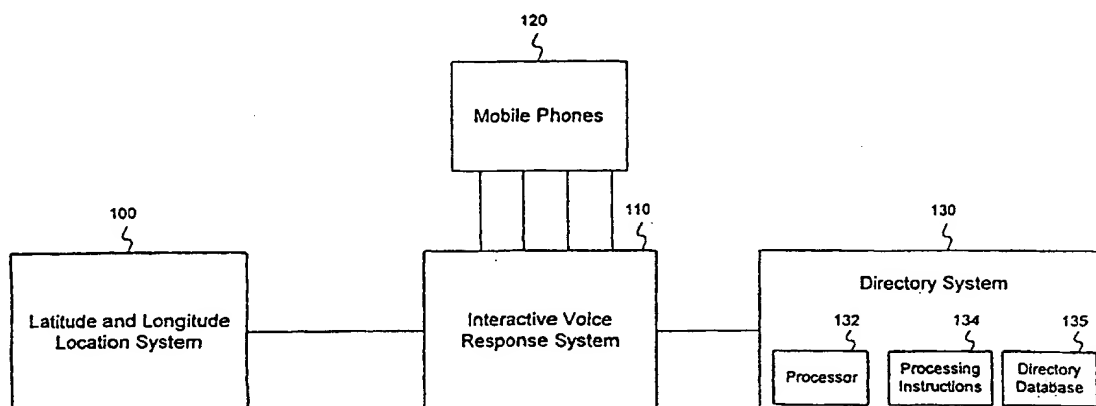




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**(54) Title:** MOBILE TELEPHONE LOCATION-BASED DIRECTORY SYSTEM

**(57) Abstract**

Systems and methods provide directory assistance to a mobile telephone user including finding services closest to a current location of the mobile telephone user. The present invention determines the latitude and longitude coordinates of the calling mobile telephone (120) using a standard latitude and longitude location system (100). A directory system (130) finds the services that match the user's request using a directory data base that stores services and latitude/longitude coordinates for the services. The directory system (130) searches for services that meet user selected service parameters and are closest to the mobile telephone (120).

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## MOBILE TELEPHONE LOCATION-BASED DIRECTORY SYSTEM

### TECHNICAL FIELD

The present invention is directed to a system for providing location-based directory assistance to mobile telephone users, and more particularly, to systems and methods that determine the location of a mobile telephone and provide directory assistance listing businesses closest to the mobile telephone user.

### BACKGROUND ART

Users of cellular or mobile telephones do not usually stay in a fixed location. Furthermore, mobile telephone users typically do not have telephone books available to them during their travels. So mobile telephone systems typically offer their users some form of directory assistance. Just like the public telephone directory assistance, the mobile telephone directory assistance systems receive a requested name or business from the user and return a telephone number.

Conventional mobile systems, however, do not use information about a user's location when providing directory assistance. Current directory assistance systems only allow a user to request the number of a specific business, and make no effort to select businesses nearest the user.

### DISCLOSURE OF INVENTION

Systems and methods consistent with the principles of the present invention address this need by providing a directory assistance system that provides information to a user based on their mobile telephone location.

A system consistent with the present invention includes an interactive voice response system for receiving a telephone call. A location information system determines a location of the calling telephone. A business database lists information about businesses, such as a telephone number, address, and location data. A directory system selects businesses from the business database based on the location of the telephone.

Another system consistent with the present invention includes an interactive voice response system for receiving a telephone call designating business parameters. A location information system determines a location of the

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calling telephone. A business database lists information about businesses, such as a telephone number and an address. A directory system selects businesses from the business database that match the business parameters. The directory system accesses a global positioning system to find a location of the matching businesses and selects the businesses closest to the location of the telephone.

A method consistent with the principles of the present invention includes steps for receiving a telephone call designating business parameters, receiving data providing a location of the telephone, and searching a directory database for businesses that meet the business parameters and are closest to the location of the telephone.

Another method consistent with the principles of the present invention includes steps and structure for receiving a telephone call requesting information related to a set of parameters, receiving data reflecting a location of the telephone, searching a directory database for businesses that match the parameters, accessing a global positioning system to request location data and driving directions for each of the businesses that match the parameters, comparing the telephone location to the business location data, and selecting a business closest to the telephone based on the comparison.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate an embodiment of the invention and, together with the description, explain the advantages and principles of the invention. In the drawings:

Fig. 1 is a block diagram showing the elements of one system consistent with the present invention;

Fig. 2 is a flow chart showing the steps for processing directory assistance requests from mobile telephones according to the system shown in Fig. 1;

Fig. 3 is a block diagram showing the elements in another system consistent with the present invention; and

Fig. 4 is a flow chart showing the steps for processing directory assistance requests from mobile telephones according to the system shown in Fig. 3.

### BEST MODE FOR CARRYING OUT THE INVENTION

The following detailed description of the invention refers to the accompanying drawings. The same reference numbers in different drawings identify the same or similar elements. Also, the following detailed description does not limit the invention. Instead, the scope of the invention is defined by the appended claims.

Systems and methods consistent with the principles of the present invention provide directory assistance to mobile telephone users based on their location. When a call to directory assistance is received, the system determines a user's location and provides the user with a list of businesses closest to that location.

Fig. 1 is a block diagram showing one system consistent with the present invention. Users of mobile telephones 120 needing directory assistance call a directory assistance interactive voice response system 110. Interactive voice response system 110 is an existing interface system that converts text to speech and speech to text allowing the system to provide instructions and information to a telephone user and the user to provide instructions and information to the system. A standard mobile telephone latitude and longitude location system 100 determines latitude and longitude coordinates associated with received mobile telephone calls and returns this information to the interactive voice response system 110. The Federal Communications Commission (FCC) requires a standard latitude/longitude determination system be used in all mobile telephone systems. Interactive voice response system 110 forwards the request for assistance and the latitude and longitude coordinates of the mobile telephone to the directory system 130. Directory system 130 includes a processor 132 and processing instructions 134 for processing directory assistance requests. Directory system 130 also includes a directory data base 135 that lists businesses, latitude/longitude coordinates for the businesses and information related to the businesses such as telephone numbers and addresses.

Fig. 2 shows steps for processing directory assistance requests consistent with the present invention shown in Fig. 1. Users at mobile telephones 120 call for directory assistance by calling the interactive voice response system 110 (step

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200). Interactive voice response system 110 retrieves the latitude//longitude coordinates of the calling mobile telephone from the standard latitude and longitude location system 100 (step 210). Directory system 130 receives a request for information, including business parameters such as requesting a telephone number or address of a gas station, from the mobile telephone user through the interactive voice response system 110 (step 220). Default business parameters may also be forwarded to the directory system 130 from the interactive voice response system 110 or may be stored in the directory system 130.

Default parameters may also be used when no parameter is provided by a user for a given field such as a distance to business field. Directory system 130 searches the directory data base 135 for businesses that meet the selected business parameters and any default business parameters (step 230). Directory system 130 selects from the businesses matching the parameters, those that have latitude and longitude coordinates closest to the mobile telephone's latitude and longitude coordinates. This is done by standard distance computing algorithms that determine the distance between the mobile telephone's latitude and longitude coordinates and the businesses' latitude and longitude coordinates in directory data base 135 (step 240). Interactive voice response system 110 then forwards the selected businesses to the mobile telephone 120 from which the request came (step 250).

For example, the user may wish to find information about gas stations closest to him or her. In this case, the directory system 130 will search the directory data base 135 for gas stations of the appropriate type (e.g. those that the user has a credit card), and compares the latitude and longitude coordinates in the directory data base 135 to the mobile telephone 120 location. The directory system 130 may return information about the closest gas station or may provide a list of the closest gas stations to the user and ask the user to select ones of interest.

Fig. 3 shows another system consistent with the present invention that uses the global positioning satellite system (GPS). GPS is an existing nonmobile telephone-based location tracking system that finds the location of receivers using

satellites. GPS not only determines a latitude and longitude of a receiver but also includes commercial databases with information on the location of businesses, residences, parks, etc. in latitude and longitude format to aid in navigating a receiver. GPS systems have the capability of providing directions to guide a receiver from location to location.

Users at mobile telephones 120 needing directory assistance call the directory assistance interactive voice response system 310. A mobile telephone standard latitude and longitude location system 100 is in communication with the interactive voice response system 110 and determines latitude and longitude coordinates for the calling mobile telephone. Interactive voice response system 310 forwards the request for assistance received from the user and the latitude and longitude coordinates of the mobile telephone to directory system 330.

Directory system 330 includes a processor 332 and processing instructions 334 for processing requests and accessing GPS 300. Directory system 330 also includes directory database 335 that lists businesses and information associated with the businesses such as telephone numbers, addresses, and a business type. GPS 300 includes a GPS data base 305 that stores businesses and latitude/longitude coordinates for the businesses. Directory system 330 searches directory database 335 for businesses relevant to a user's directory assistance request and then queries GPS 300 for latitude/longitude coordinates for the relevant businesses. Directory system 300 selects the closest businesses to the mobile telephone 120 and returns the information and driving directions to the business to the user.

Fig. 4 shows the steps for providing directory assistance according to the system shown in Fig. 3. Mobile telephones 120 call for directory assistance by calling the interactive voice response system 110 (step 400). Interactive voice response system 110 retrieves the latitude and longitude coordinates for the calling mobile telephone from the standard latitude and longitude location system 100 (step 410). Directory system 130 receives a request for information from the mobile telephone user through the interactive voice response system 110 including business parameters such as requesting an address of a gas station closest to the mobile telephone (step 420). Default business parameters may

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also be forwarded to the directory system 130 from the interactive voice response system 110 or may be stored in the directory system 130. Directory system 130 searches the directory data base 135 for businesses that meet the selected business parameters and any default business parameters (step 430). Directory system 130 accesses GPS 300 to obtain latitude and longitude coordinates for the found businesses that meet the business parameters (step 440). Directory system 130 selects the businesses closest to the user and forwards the information to the mobile telephone via the interactive voice response system 310 (step 450). In one implementation, GPS 300 may provide the user directions to a business using the interactive voice response system 110 to verbally recite directions to the user.

The systems and methods consistent with the present invention provide directory assistance to mobile telephone users and provides information on businesses closest to the present location of the mobile user. The foregoing description of preferred embodiments of the present invention provides illustration and description, but is not intended to be exhaustive or to limit the invention to the precise form disclosed. Modifications and variations are possible in light of the above teachings or may be acquired from practice of the invention. For example, the directory information may include a street address for businesses, and a map data base may be used to compare the location of the mobile telephone on the map to the location of the businesses on the map in order to find businesses that are close to the user. In addition, the user may request information for businesses that are close to a point that is not the current location of the mobile telephone. The scope of the invention is defined by the claims and their equivalents.



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WHAT IS CLAIMED IS:

1. A system for processing directory assistance requests using a directory database holding directory assistance information comprising:
  - a memory including program instructions; and
  - a processor operating responsive to the program instructions to:
    - receive a request for database information related to a desired type of service;
    - receive data providing a location of the origin of the request;
    - and
    - search the directory database for target services meeting the request, and based on the location of the origin of the request.
2. The system of claim 1 wherein the processor further operates responsive to program instructions to:
  - receive service parameters; and
  - search the directory database for services that match the service parameters.
3. The system of claim 2 wherein the processor further operates responsive to program instructions to:
  - select the target services closest in distance to the origin of the request.
4. The system of claim 1 wherein the processor further operates responsive to program instructions to:
  - process a call from a mobile telephone.
5. The system of claim 1 wherein the processor further operates responsive to the program instructions to:

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obtain latitude and longitude coordinates for the origin of the request.

6. The system of claim 5 wherein the directory database stores latitude and longitude coordinates associated with each service stored in the database and wherein the processor further operates responsive to program instructions to:
  - receive service parameters;
  - search the directory database for services that match the service parameters; and
  - select, from the services that match the service parameters, services with latitude and longitude coordinates closest to the latitude and longitude coordinates of the origin of the request.

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7. A system for processing directory assistance requests using a directory database holding service information comprising:

- a memory including program instructions; and

- a processor operating responsive to the program instructions to:

- receive a request for directory information including a set of parameters;

- receive data reflecting a location of an origin of the request;

- search a directory database for services that match the parameters;

- access a global positioning system to request location information for each of the services that match the parameters;

- compare the origin location information to the service location information; and

- select a service closest to the origin of the request.

8. The system of claim 7 wherein the processor further operates responsive to program instructions to:

- receive data including longitude and latitude coordinates for the origin of the request;

- access the global positioning system to request latitude and longitude coordinates for the services that match the parameters; and

- compare the origin latitude and longitude coordinates to the service latitude and longitude coordinates.

9. The system of claim 7 wherein the processor further operates responsive to program instructions to:

- receive a call from a mobile telephone; and

- receive data reflecting a location of the mobile telephone.

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10. A directory assistance system for processing a directory assistance request, said system comprising:

a location information system that determines a location of the origin of the request;

a service database listing information about services; and

a directory system for selecting services from the service database based on the location of the origin of the request.

11. The directory assistance system according to claim 10 further comprising:

an interactive voice response system that receives the request from a mobile telephone.

12. The directory assistance system according to claim 11 wherein the location information system includes:

a latitude and longitude location information system that determines latitude and longitude coordinates associated with a calling mobile telephone.

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13. A directory assistance system for processing a directory assistance request, said system comprising:

a location information system that determines a location of origin of the request;

a service database listing information about services;

a global positioning system having data on locations of services;

a directory system for searching the service database for services that match the directory assistance request;

a requesting module for requesting data on locations for the matching services from the global positioning system; and

selecting the matching services closest to the location of the origin of the request.

14. The directory assistance system according to claim 13 further comprising:

an interactive voice response system that receives the request from a telephone.

15. The directory assistance system according to claim 13 wherein the location information system further includes:

a latitude and longitude location information system that determines latitude and longitude coordinates associated with a calling mobile telephone.

16. The directory assistance system according to claim 14 wherein the interactive voice response system receives directions to a service from said global positioning system and provides the directions to the origin of the request.

17. A method of processing directory assistance requests using a directory database holding service information comprising the steps of:

receiving a request for directory information related to a desired type of service;

receiving data providing a location of the origin of the request; and

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searching the directory database for services based on the location of the origin of the request.

18. The method of claim 17 further including the steps of:  
receiving service parameters; and  
searching the directory database for services that match the service parameters.

19. The method of claim 18 further including the steps of:  
selecting, from the services that match the service parameters,  
services closest to the origin of the request.

20. The method of claim 17 further including the steps of:  
obtaining latitude and longitude coordinates for the origin of the request.

21. The method of claim 20 wherein the directory database stores latitude and longitude coordinates associated with each service stored in the database, said method further including the steps of:  
receiving service parameters;  
searching the directory database for services that match the service parameters; and  
selecting, from the services that match the service parameters, services with latitude and longitude coordinates closest to the latitude and longitude coordinates of the origin of the request.

22. A method for processing directory assistance requests using a directory database holding service information comprising:  
a memory including program instructions; and  
a processor operating responsive to the program instructions to:  
receiving a request for information related to a set of parameters;  
receiving data reflecting an origin of the request;

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searching a directory database for services that match the parameters;

accessing a global positioning system to request location data for each of the services that match the parameters;

location comparing the origin of the request location to the service data;

on selecting a service closest to the origin of the request based on the comparison.

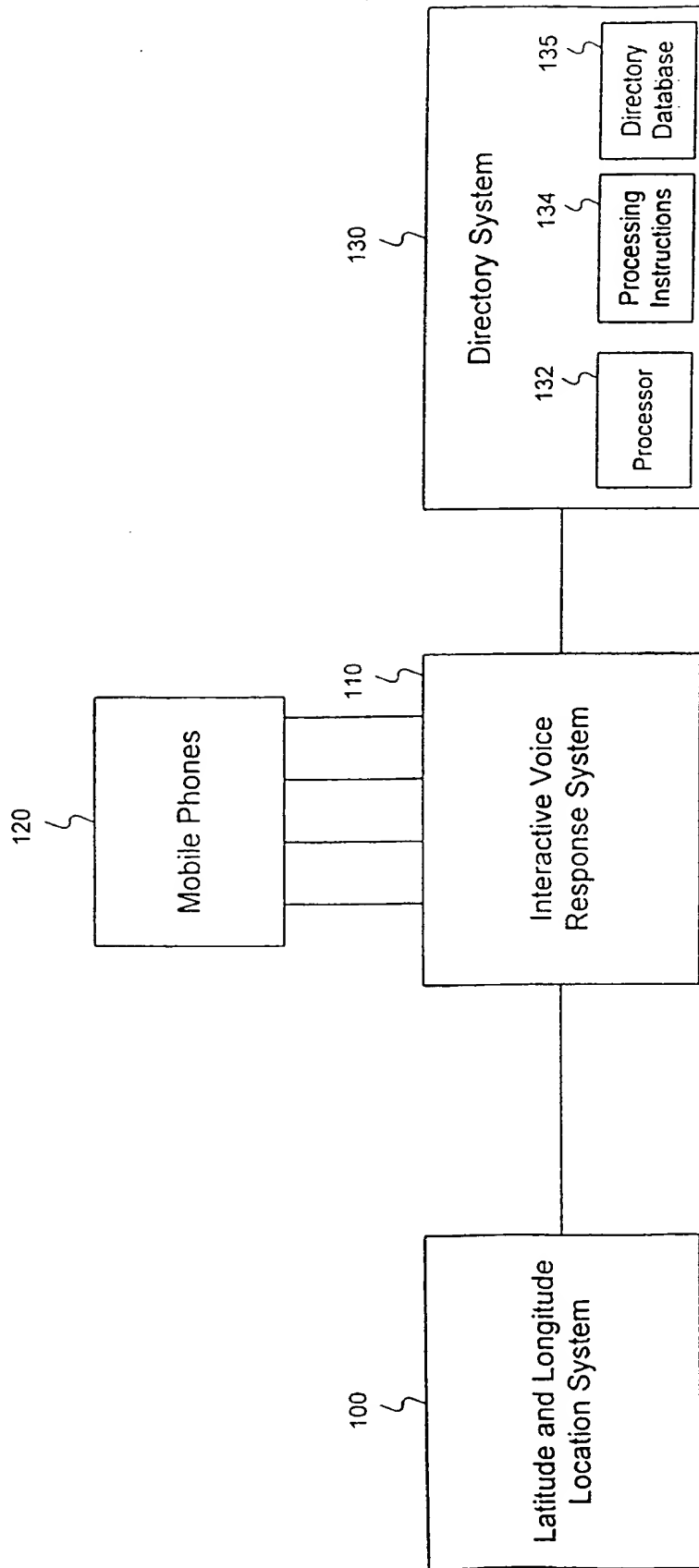


FIG. 1



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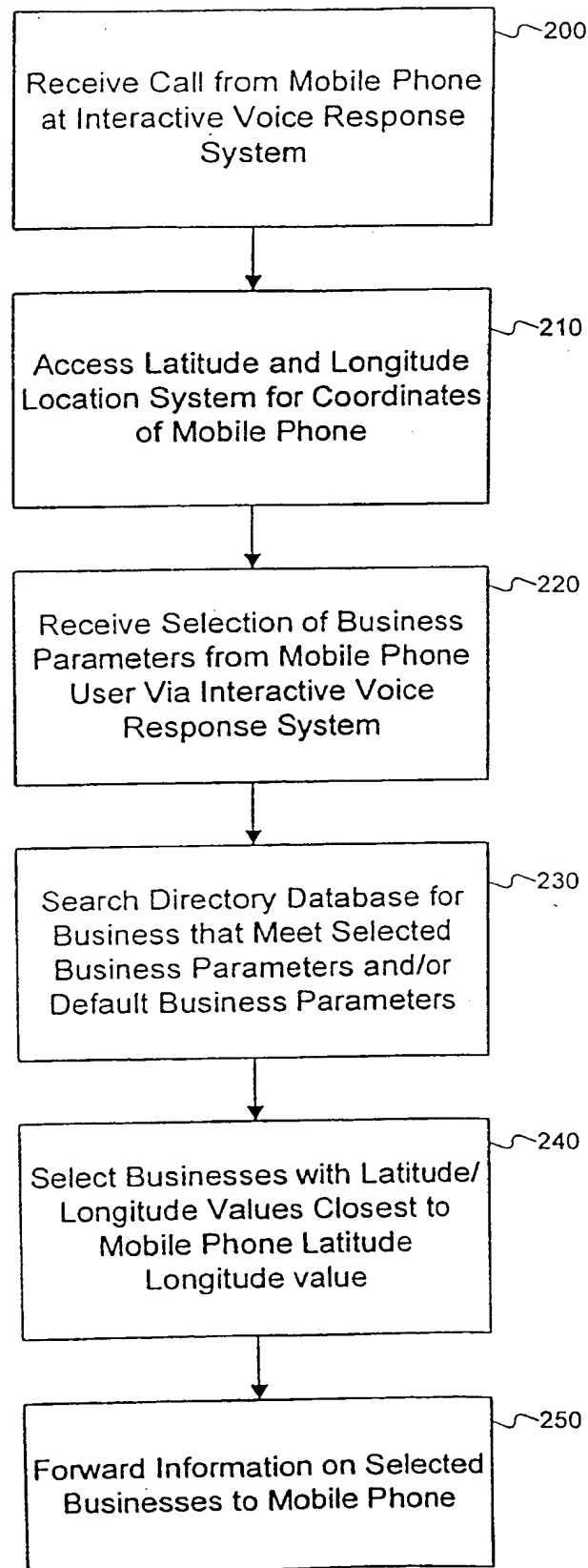


FIG. 2

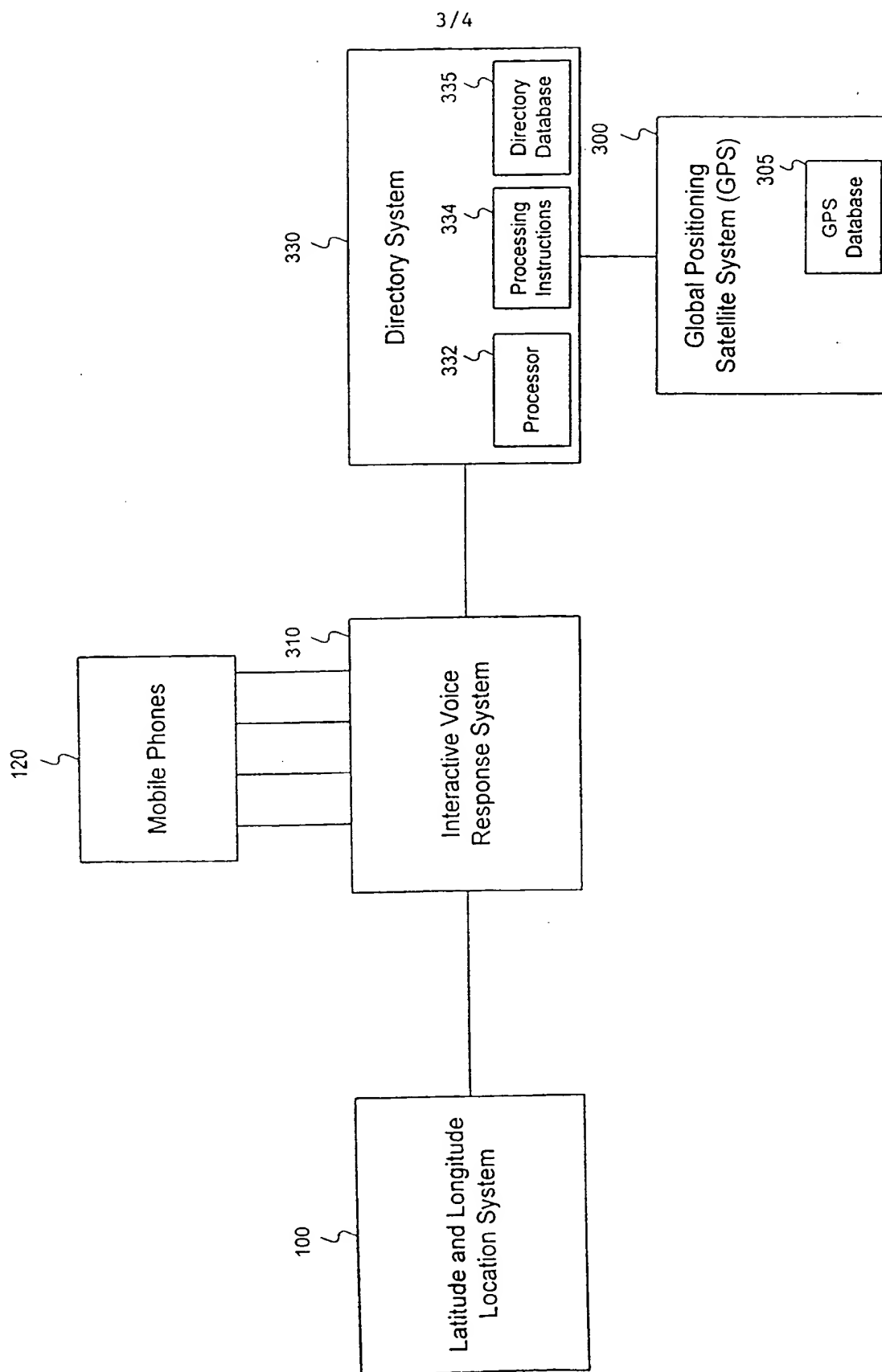
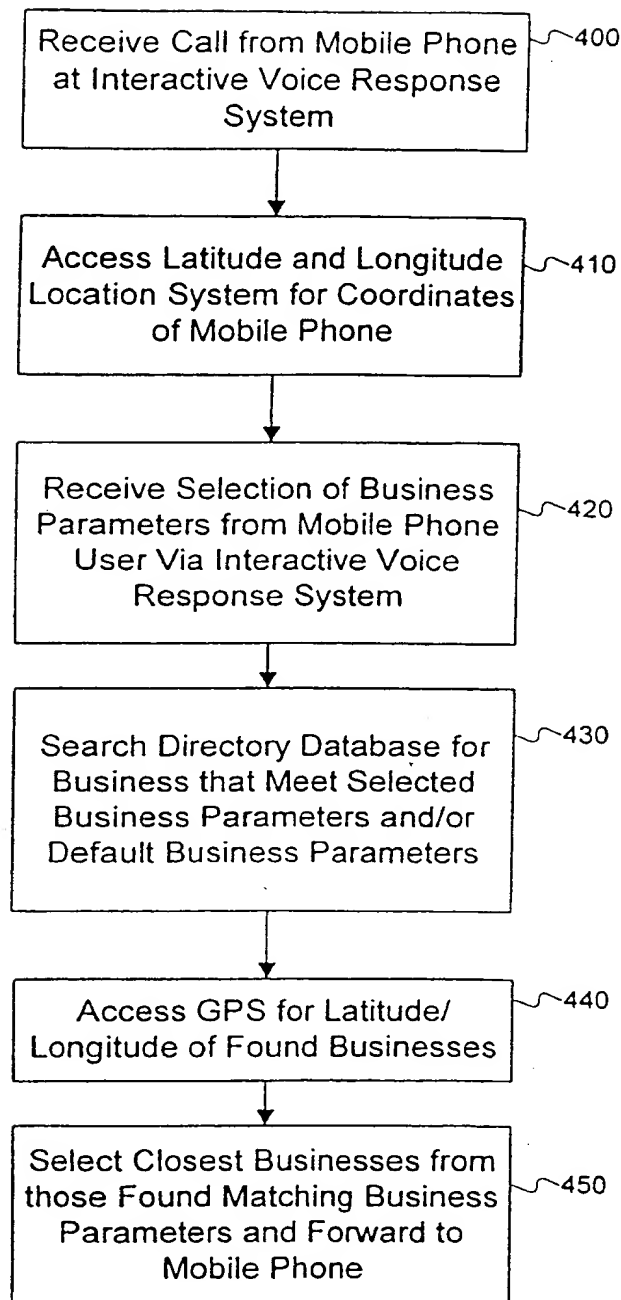


FIG. 3

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**FIG. 4**

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/21998

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : H04Q 7/20

US CL : 455/456, 342/457

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 455/456, 342/457 455/457, 426

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WEST

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,684,859 A (CHANROO et al.) 04 November 1997, see abstract	1-22
Y	US 5,579,535 A (ORLEN et al.) 26 November 1996, see column 1, line 49 through column 2, line 7	1-22
Y	US 5,561,704 A (SALIMANDO) 01 October 1996, see abstract	1-22



Further documents are listed in the continuation of Box C.



See patent family annex.

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